References
[1] Cicerone KD, Dahlberg C, Malec JF, Langenbahn DM, Felicetti T, Kneipp S, et al. Evidence-based cognitive rehabilitation: updated review of the literature from 1998 through 2002. Arch Phys Med Rehabil 2005;86(8):1681–92.
[2] Klinger E, Joseph PA. Rééducation des troubles cognitifs par réalité virtuelle. In: Froger J, Pélissier J, editors. Rééducation instrumentalisée après cérébrolésion vasculaire. Paris: Masson; 2008. p. 149–65.

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Place of rTMS in rehabilitation

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Keywords: Transcranial magnetic stimulation; Brain plasticity

Transcranial magnetic stimulation (TMS) is a technique for noninvasive brain stimulation used in humans. The sudden change of a magnetic field can induce an electric current in nerve tissue and depolarize the axons of neurons in the motor cortex. This technique was first used to study the plasticity of the motor cortex with the production of brain mapping and to quantify the excitability of different brain areas. More recently, repetitive transcranial magnetic stimulations (rTMS) have demonstrated their ability to modulate cortical plasticity. rTMS is applied to repeated stimulation at a variable frequency from 1 to 50 Hz for periods of 1–30 min. The nature of the resulting post-effects of this stimulation depends on the frequency, intensity and temporal organization of stimulus. Stimuli applied at a frequency of 1 Hz are most often responsible for a sustained decrease in the excitability of the motor cortex, whereas higher frequencies lead to an opposite result. Because rTMS can modulate brain activity, it has been used at least in a single session in many diseases. The results of these studies open the most opportunities for the use of this new therapeutic tool in neurorehabilitation. Nevertheless there are studies in a single session mostly on intermediate standards (electrophysiology) and not on clinical criteria. The extension of this method of brain stimulation thus requires further, multicenter double-blind randomized versus sham tries to study their influence on clinical criteria of recovery. As such it is essential that teams of physical medicine and rehabilitation may be involved in this validation for the passage of what is still an experimental concept to an actual therapeutic application.

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Transcranial direct current stimulation associated with physical therapy after stroke: Feasability of a prospective, randomised, double blinded, sham controlled study

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Keywords: Hemiparesis; Stroke; Cerebral stimulation; tDCS; Prehension

Introduction.– Transcranial direct current stimulation (tDCS) has been proposed in pilot studies for the treatment of different deficiencies following stroke [1,2]; the presented results were very encouraging, especially for studies with repeated sessions [2]. In fact, tDCS can modulate plasticity following stroke, and can promote the injured hemisphere in the interhemispheric competition. tDCS is easy to perform, its cost is low, and the feasibility of a blinded study is much easier with tDCS than with other cerebral stimulation methods.
Objectives.– To evaluate the feasibility of a study for stroke patients, that would associate tDCS stimulation with physical therapy of the upper limb, in order to evaluate its effects on the affected upper limb function.
Methods.– Prospective, randomised, sham controlled, double blinded study. The upper limb function evolution (Jebsen Taylor Test, Fugl Meyer, Box and Block test, Grip strength) and the autonomy (FIM) in two groups of stroke patients was evaluated. The real or sham stimulation was performed daily during a physical therapy session for 10 consecutive days.
Results.– Six patients were included. 1 patient could easily determine he had a real stimulation; 1 patient did not tolerate the stimulation and withdrew from the experiment. No other adverse reaction was noticed. All the included patients had better performances after the intervention. The stimulations were easy to perform and did not perturb de physical therapy session.
Discussion–Conclusion.– Feasibility of a study with enough power is demonstrated. The number of patients has to be increased in order to statistically compare performance in the two groups.

References
[1] Hummel F, Celnik P, et al. Effects of non-invasive cortical stimulation on skilled motor function in chronic stroke. Brain 2005;128(Pt 3):490–9.
[2] Boggio PS, Nunes A, et al. Repeated sessions of noninvasive brain DC stimulation is associated with motor function improvement in stroke patients. Restor Neurol Neurosci 2007;25(2):123–9.
[3] Hummel C, Celnik P, et al. Controversy: Noninvasive and invasive cortical stimulation show efficacy in treating stroke patients. Brain Stimulation 2008;1:370–82.

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Neural bases of Aubert effect and prospects in rehabilitation

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Keywords: Visual vertical; Stroke; Aubert effect

Introduction.– The Aubert effect [1] is a tilt of visual vertical (VV) towards the body during lateral body tilt. Interpretation refers to internal model of verticality, with greater reweighting of somaesthetic graviception upon vestibular graviception. To date, presence of a synthesis of somaesthetic and vestibular graviception has not been proved, and its neural bases have not been analysed. This was the aim of this study.
Materials and methods.– Fourteen paraplegic subjects (T4-T12 ASIA A), 23 hemispheric subjects (unique hemisphere stroke) and 39 control subjects were studied. VV was assessed in upright sitting position and in laterally-tilted postures (50° for paraplegics, 30° for hemiplegics). In hemiplegics, hypoesthesia was quantified and cerebral lesion location was analysed.
Results.– Upright, VV was accurate, but more variable in paraplegics than in controls. This indicates that the somaesthetic graviception contributes to the sense of verticality, even in upright position.
As expected, a spontaneous contralesional VV tilt ($-4.7 \pm 4.7°$; $P < 0.001$) was found in hemiplegics. Lateral tilts induced Aubert effect in controls (average = 5°), whereas it was abolished in paraplegics. This means there is a modulation of VV by somesthaesic informations.
In hemiplegics, Aubert effect was decreased during contralesional tilt, proportionally to hypoesthesia degree ($r = -0.55$; $P < 0.01$). This gradient proves the existence of a synthesis of vestibular and somaesthetic graviceptions. Anatomical analysis showed that this synthesis was made in the posterolateral thalamus ($P = 0{,}003$). Interestingly, ipsilesional tilt in hemiplegics normalized VV ($-4.7 \pm 4.7°$ vs $1.1 \pm 4.5°$; $P < 0.01$).
Discussion–Conclusion.– The Aubert effect results from a synthesis of vestibular and somaesthetic graviceptions, in which the posterolateral thalamus plays a major role [2]. Aubert effect could be useful in clinical practice: ipsilesional tilt may readjust VV in hemiplegics. Whether this improvement lasts together with its positive effects on balance need to be studied.

References
[1] Aubert H. Eine scheinbare bedeutende Drehung von Objekten bei Neigung des Kopfes nach rechts oder links. Virchows Arch 1861;20:381–93.